SIN 485

Issue 1.4
September 2020

Suppliers' Information Note

For The BT Network

BT IPstream Connect Office, BT IPstream Connect Home, BT IPstream Connect Max & BT IPstream Connect Max Premium Products

Service Description and Interface Specification

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1. Introduction

Definitions:

Customer: The Service Provider (SP) or Business Customer (BC) who purchases the BT IPstream Connect service from BT and sells or provides it to End-Users.

End User: The person using their PC to connect to an SP/BC's IP network via the BT IPstream Connect service.

Please note: A phased approach is being undertaken to stop new supply on BT IPstream Connect end user access, on an exchange basis. The BT IPstream Connect end user service will be retired at exchanges served by the Wholesale Broadband Connect product.

This Suppliers' Information Note (SIN) provides service description information about BT IPstream Connect Office 500/1000/2000, BT IPstream Connect Home 500/1000/2000, BT IPstream Connect Max and BT IPstream Connect Max Premium which form part of BT's Internet Protocol (IP) Transport Services portfolio (SIN 302[1])..

These additions to the BT IPstream Connect portfolio introduced products where the End User termination is a 'wires only' G.DMT interface. Thus BT will not supply end user NTE devices as part of the service and the End User termination will be not be managed by BT. The Customer or End User must supply CPE, which should comply with this SIN, in order to interoperate successfully with the BT service. Thus this SIN is published to help Customers and suppliers of CPE devices to develop their offerings for these products.

This SIN should be read in conjunction with SIN 329 detailing BT's launched Broadband IP products and SIN 346[2] detailing BT's G.DMT interface.

This SIN provides information for use by BT and Customers - Independent Service Providers (SPs), Providers of Electronic Communications Networks and Corporate Businesses - and Customer Premises Equipment (CPE) manufacturers and developers.

All BT IPstream Connect products are provided on shared infrastructure. The BT IPstream Connect Office and BT IPstream Connect Max Premium products have priority, through the shared part of the BT IPstream Connect network over the BT IPstream Connect Home and BT IPstream Connect Max products. This means that under network congestion a BT IPstream Connect Office or BT IPstream Connect Max Premium product will receive a higher downstream throughput than the equivalent BT IPstream Connect Home or IPstream Connect Max product.

The BT IPstream Connect Handover product (see SIN 482) provides a connection from the BT Network to the Customer at each of the point of service interconnects (of which there are currently 10) and is a necessary component for the end-to-end connection of the Customer to the BT IPstream Connect Office Series, the BT IPstream Connect Home Series, the IPstream Connect Max and the IPstream Connect Max Premium products. The BT IPstream Connect Handover product is available for use by Customers (including OLOs, and Business Customers) to connect a number of End Users to their network.

BT IPstream Connect enables a Customer to access multiple End Users via an IP network. The Customer owns the sales, marketing and recruitment of End Users and the contractual/service relationship. BT supplies the delivery transport and basic service.

If you have inquiries relating to this document, then please contact: sinet.helpdesk@bt.com

Note: This issue of SIN 485 includes changes to the products so that under certain circumstances (as outlined in the BT IPstream Connect Max Customer Handbook) services can be placed onto capped rate profiles to assist in stabilising the line or to ensure line rate is not less than the original line rate when re-grading over from the BT IPstream Connect Home & Office products.

2. Availability

The BT IPstream Connect products will only be available over BT provided PSTN Lines (including Wholesale Access). There are also technical reach limitations, which will prevent ADSL-carried services being available to End Users beyond approximately 3.5 km from the local exchange for the BT IPstream Connect Home 2000 and BT IPstream Connect Office 2000 products and beyond approximately 6 km for the, BT IPstream Connect Home 1000 and BT IPstream Connect Office 1000. However, users on BT IPstream Connect Home 500, Office 500, Max and Max Premium products may be able to obtain service at greater distances from their local exchange. For the Max products it is likely that only the lower end of the rate adaptive range will be achievable at these greater distances. Note: The reach limits on the ‘fixed’ and ‘rate adaptive’ products came into force on the 6th September 2004. Prior to this date the limit was 6 km for the ‘rate adaptive’, and 3.5km for the ‘fixed’ products.

During the initial order handling process, BT will check the suitability of the line for ADSL services and advise accordingly.

The products are only available in areas where BT has rolled out 20c ADSL exchange equipment. There may be further availability limitations on BT IPstream Connect Max and BT IPstream Connect Max Premium where backhaul limitations exist (e.g. Exchange Activate Sites).

Some existing telephony based services may be affected by the techniques used to deliver the BT IPstream Connect services over the same metallic line. These include:

- 30K Loop
- Private Circuits
- ISDN – all types
- Meter pulse facility
- Red ABC
- RedCare
- FeatureNet 5000 services
- Home Highway / Business Highway
- PBX extension lines

BT can only provide a single BT IPstream Connect service over a single PSTN exchange line.

End Users can only receive a single Broadband Service over a PSTN line.

This list is not exhaustive. We will endeavour to update this list, as new information becomes available.

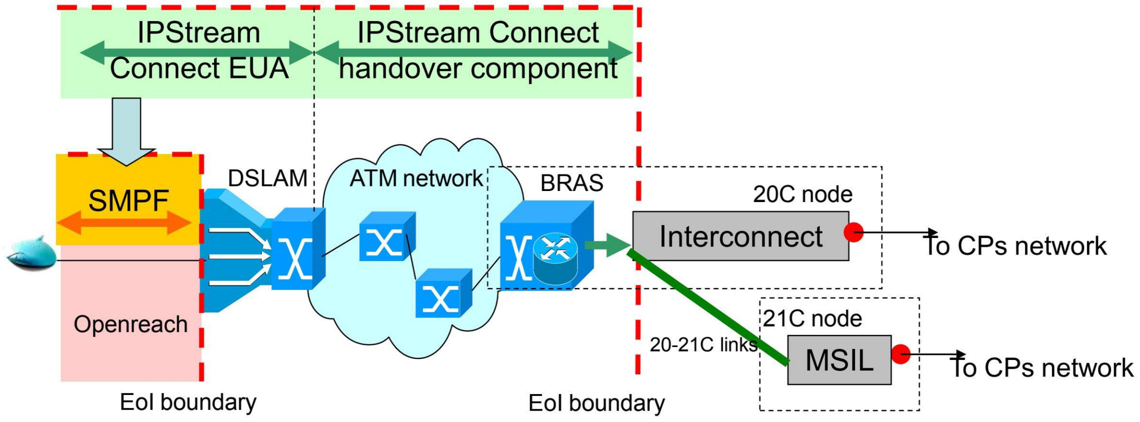
> *Note. Some telephone and fax CPE is sensitive to the ADSL signal even after filtering (the filter is designed to remove the ADSL signal, but inevitably a tiny residual signal is left behind). The likelihood of a problem arising depends on the susceptibility of the CPE, the performance of the filter and the line conditions.*
>
> *If problems are only experienced by telephone or fax CPE when the ADSL modem is connected, then it is recommended that the following checks be undertaken:*
>
> - *Check that filters are fitted to all CPE e.g. Sky digibox, alarm systems etc.,*
> - *Check for a faulty micro filter – all filters should be checked as it may not be the one on the affected CPE that is causing the problem,*
> - *If the above steps fail to solve the problem, the telephone/fax CPE is probably susceptible to the residual ADSL signal after filtering. This can be confirmed by adding a second stage of filtering using an additional micro-filter on the affected CPE. If successful, this is a potential solution for the customer as filters are available from SPs and high street shops.*

It is also important that the above is undertaken if problems are experienced with either Telephone / Fax CPE or the actual BT IPstream Connect Max & Max Premium service when re-grading from BT IPstream Connect Home or Office to BT IPstream Connect Max or Max Premium Service. This is because the effect of interference due to the lack of filters or presence of faulty filters may not always be apparent on the Home/Office services. However, for BT IPstream Connect Max or Max Premium services the presence of such interference will reduce the actual line rates and stability of the service. Additionally any internal wiring within the End User premises must be correctly installed, as incorrect or poorly installed wiring can significantly affect the BT IPstream Connect Max & Max Premium services.

3. Service Outline

BT IPstream Connect service consists of the following access products: BT IPstream Connect Handover, BT IPstream Connect Office series, BT IPstream Connect Home series, BT IPstream Connect Max and BT IPstream Connect Max Premium. For end-to-end service the Customer will need connectivity to each of the point of service interconnects via the BT IPstream Connect Handover product and multiple BT IPstream Office/Home/Max products.

The basic architecture of the BT IPstream Connect product set is as follows:


IPStream Connect EUA
IPStream Connect handover component
SMPF
DSLAM
ATM network
BRAS
20C node
Interconnect
To CPs network
Openreach
21C node
20-21C links
MSIL
To CPs network
EoI boundary
EoI boundary

BT IPStream Connect
End user Access products:

BT IPStream Connect:
- Home 500/1000/2000
- Office 500/1000/2000
- Max
- Max Premium

BT IPStream Connect Handover Component, with option of interconnect at 20C node or 21C node (via MSIL)

Figure 1 Basic architecture of the BT IPstream Connect products

The BT IPstream Connect products enable connectivity between End Users and BT's High Speed Data Network. Customers will be provided with IP connections to End Users' premises using ADSL technology.

The End Users connections are provided using the same copper access network as existing PSTN services. The ADSL technology over the copper pairs feeding each End User ensures that BT IPstream Connect products and the PSTN service can co-exist. This service will only be available on a BT provided PSTN (or BT provided Wholesale Access) lines.

4. BT IPstream Connect Office/Home/Max Series

4.1 General

This provides session controlled ADSL based IP connectivity between an End User and a Broadband Remote Access Server (BRAS) in the network, from which the End User connects to the Customer.

The BT IPstream Connect Office/Home/Max products present a 'wires only' (G.992.1[4]) interface to the End User as per SIN 346[2].

This service is restricted to a single Customer; however, that customer can choose to allow his end users the facility of “Limited Service Selection” (see SIN 482).

Typically, the End Users require occasional fast but ‘bursty’ access to private network facilities and / or the Internet (via the Customer). The products are not suitable for End Users who require continuous bit-rate, full-bandwidth services.

Table 1 gives a comparison of data rates of the products discussed within this SIN.

	EUA Upstream		**EUA Downstream**	
	User Data Rate (kbit/s) *(DSL line rate)*	**ATM Payload Rate (kbit/s)**	**User Data Rate (kbit/s)** *(DSL line rate)*	**ATM Payload Rate (kbit/s)**
BT IPstream Connect Office 500	Adaptive 64-288 kbit/s	Adaptive 57-256 kbit/s	576 kbit/s	Up to 512 kbit/s
BT IPstream Connect Office 1000	288 kbit/s	Up to 256 kbit/s	1152 kbit/s	Up to 1024 kbit/s
BT IPstream Connect Office 2000	288 kbit/s	Up to 256 kbit/s	2272 kbit/s	Up to 2048 kbit/s
BT IPstream Connect Home 500	Adaptive 64-288 kbit/s	Adaptive 57-256 kbit/s	576 kbit/s	Up to 512 kbit/s
BT IPstream Connect Home 1000	288 kbit/s	Up to 256 kbit/s	1152 kbit/s	Up to 1024 kbit/s
BT IPstream Connect Home 2000	288 kbit/s	Up to 256 kbit/s	2272 kbit/s	Up to 2048 kbit/s
BT IPstream Connect Max	Adaptive 64-448 kbit/s	Adaptive 57-398 kbit/s	Adaptive between 288*– 8128 kbit/s	Adaptive between 256 -7320 kbit/s
BT IPstream Connect Max Premium	Adaptive 64-832 kbit/s	Adaptive 57-750 kbit/s	Adaptive between 288*– 8128 kbit/s	Adaptive between 256 -7320 kbit/s

* A line can Rate Adapt down to 160 kbit/s but BT will only support lines able to work stably at 288 kbit/s and above.

Table 1. BT IPstream Connect Data Rates

Additionally BT IPstream Connect Max and BT IPstream Connect Max Premium products may under certain circumstances (as outlined in the BT IPstream Connect Max Customer Handbook) be placed onto capped rate profiles to assist in stabilising the line or to ensure line rate is not less than the original line rate when re-grading over from the BT IPstream Connect Home & Office products.

Note these are not product offerings or a separate end user access option and cannot be ordered directly via BT ordering systems.

	EUA Upstream		**EUA Downstream**	
	User Data Rate (kbit/s) *(DSL line rate)*	**ATM Payload Rate (kbit/s)**	**User Data Rate (kbit/s)** *(DSL line rate)*	**ATM Payload Rate (kbit/s)**
Max – Capped Rate Profile 500	Adaptive 64-288 kbit/s	Adaptive 57-256 kbit/s	576 kbit/s	Up to 512 kbit/s
Max – Capped Rate Profile 1000	288 kbit/s	Up to 256 kbit/s	1152 kbit/s	Up to 1024 kbit/s
Max – Capped Rate Profile 2000	288 kbit/s	Up to 256 kbit/s	2272 kbit/s	Up to 2048 kbit/s
Max Premium – Capped Rate Profile 500	Adaptive 64-288 kbit/s	Adaptive 57-256 kbit/s	576 kbit/s	Up to 512 kbit/s
Max Premium – Capped Rate Profile 1000	288 kbit/s	Up to 256 kbit/s	1152 kbit/s	Up to 1024 kbit/s
Max Premium – Capped Rate Profile 2000	288 kbit/s	Up to 256 kbit/s	2272 kbit/s	Up to 2048 kbit/s

Table 2. BT IPstream Connect Max/ Max Premium - Capped Rate Profiles

4.2 BT IPstream Connect Office & BT IPstream Max Premium Products

The BT IPstream Connect Office & BT IPstream Connect Max Premium products are suitable for Customers addressing the SoHo, remote office and teleworking access markets, where the Customer or End User is free to choose the End User CPE.

The BT IPstream Connect Office and BT IPstream Connect Max Premium products have the following IP data rate options available for End Users:

- BT IPstream Connect Office 500 - Up to 512 kbit/s downstream; adaptive between 57 kbit/s and 256 kbit/s upstream (rate depends on line length and conditions).
- BT IPstream Connect Office 1000 - Up to 1.024 Mbit/s downstream; up to 256 kbit/s upstream.
- BT IPstream Connect Office 2000 Up to 2.048 Mbit/s downstream; up to 256 kbit/s upstream.

- BT IPstream Connect Max Premium - adaptive between 256 kbit/s and 7320 kbit/s downstream; adaptive between 57 kbit/s and 750 kbit/s upstream (rates depends on line length and conditions).[1]

The IP data rate is defined as the rate available for the transport of IP packets in the payload of ATM cells, note however that each IP packet will incur ATM adaptation layer, PPPoA/oE and encapsulation layer overheads. The maximum IP throughput rate that can actually be achieved will hence vary considerably depending upon the IP packet size. No allowance is required for the overhead introduced by the ATM layer, as this has already been taken into account in these figures.

4.3 BT IPstream Connect Home & BT IPstream Connect Max Products

The BT IPstream Connect Home & BT IPstream Connect Max products are suitable for Customers addressing the fast home Internet access market, where the Customer or End User is free to choose the End User CPE.

The BT IPstream Connect Home & BT IPstream Connect Max products have the following IP data rate options available for End Users:

- BT IPstream Connect Home 500 - Up to 512 kbit/s downstream; Up to 256 kbit/s upstream, adaptive between 57 kbit/s and 256 kbit/s upstream (rate depends on line length and conditions).
- BT IPstream Connect Home 1000 - Up to 1.024 Mbit/s downstream; Fixed at 256 kbit/s upstream.

- BT IPstream Connect Home 2000 - Up to 2.048 Mbit/s downstream; fixed at 256 kbit/s upstream

- BT IPstream Connect Max - adaptive between 256 kbit/s and 7320 kbit/s downstream; adaptive between 57 kbit/s and 398 kbit/s upstream (rates depends on line length and conditions).[2]

The IP data rate is defined as the rate available for the transport of IP packets in the payload of ATM cells. The actual data payload will be less then this as the effects of TCP/IP and PPP headers have to be taken into account, but no allowance is required for the overhead introduced by the ATM layer, as this has already been taken into account in the above figures.

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[1] Note that BT IPstream Connect Max products may under certain circumstances (as outlined in the BT IPstream Connect Max Customer Handbook) be placed onto capped rate profiles to assist in stabilising the line or to ensure line rate is not less than the original line rate when re-grading over from the BT IPstream Connect Home & Office products. These capped rate profiles are not rate adaptive.

[2] Note that BT IPStream Connect Max Premium products may under certain circumstances (as outlined in the IPstream Connect Max Customer Handbook) be placed onto capped rate profiles to assist in stabilising the line or to ensure line rate is not less than the original line rate when re-grading over from the BT IPstream Connect Home & Office products. These capped rate profiles are not rate adaptive.

4.4 BT IPstream Connect Office/Home/Max Series, End User Installation

4.4.1 BT IPstream Connect Office/Home/Max Series, End User Implementation

SIN 346[2] describes the interface presented at the end of an ADSL line at an end user's premises. It describes three possible implementation options using either a BT supplied ADSL Linebox adapter or CPE filters.

The IPstream Connect Office/Home products will utilise the CPE filter options, which will be 'self-installed' by the Customer or End User.

The physical G.DMT interface is described in SIN 346[2].

In order to correctly interoperate with the services the CPE device(s) should:

- conform to the requirements in SIN 346[2]
- support PPP over AAL5 (RFC 2364[5]) using VC based multiplexing.
- use ATM VPI/VCI pair 0/38 for data transmission/reception
- support PPP (RFC 1661[6])
- support User Authentication (PAP/CHAP) with PPP (RFC 1334[7], RFC 1994[8])
- support IPCP (RFC 1332[9])
- support PPP IPCP Extensions for Name Server Addresses (RFC 1877[10])
- carry out upstream traffic shaping to the ATM rate corresponding to the IP data rate
- not issue a CHAP challenge, but must respond if challenged.

The CPE device(s) may (optionally):

- support network renumbering (RFC 1631[11]).
- be set to become the slave in PPP negotiation (in order to speed up the negotiation process).

To establish a session to the Customer the End User CPE must supply a username, service selection name (also known as realm or domain name) and password. Two formats of presenting the service selection name and user name are supported. These are:

- End.user@link.business-name.com
- Link.business-name.com/end.user

Please note that the characters '/' '\' '%' '@' and '#' are reserved characters and can not be used in a username or service selection name.

The Customer can choose to map a service selection name to a particular type of service. The options are:

(i) Always tunnel the end users PPP session to one of a pre-defined list of tunnel end point IP addresses

(ii) Always terminate the PPP session on the BTW BRAS, assigning an IP address at random from a pool of addresses supplied by the customer

(iii) Forward the authentication request to the customer and based on the customers response perform action (i) or (ii)

Note: IP Addresses are the responsibility of the Customer to provide.

Further details on the authentication mechanisms and service selection are available in SIN 482

It is possible for customers to receive "domain/user" even if they are expecting "user@domain". How this is processed is up to the Customer.

Only those End Users authorised by the Customer to access the Customer service associated with the service selection name will be able to establish a session to that Customer.

The Customer's RADIUS Server must conditionally or unconditionally comply with the relevant RFCs.

The End User session to the Customer can be terminated by the End User or when the End User establishes a new session. The session is also terminated if the End User CPE is switched off. In exceptional circumstances, such as abusive usage by an End User, the Customer may request BT to remotely disconnect one of their End Users' sessions forcibly.

4.4.2 BT IPstream Connect Office/Home/Max Series, End User Interface

BT IPstream Connect Office/Home/Max Series is only available on an analogue BT provided PSTN line (or BT provided Wholesale Access) and is not available over BT ISDN services. This service cannot co-exist with other ADSL based services on the same PSTN line.

4.4.2.1 Physical Layer Aspects

The physical aspects of the End User Interface are described in SIN 346[2].

4.4.2.2 End User CPE Configuration

Once connected to the line, the CPE for BT IPstream Connect Office/Home services will be configured by the BT network according to the requirements of the service.

For information, the configuration parameters shown in Table 3 will be requested of the End User CPE:

Parameter	BT IPstream Connect Office/Home				BT IPstream Connect Max/Max Premium	
		500	1000	2000	Max	Max Premium
ITU G.992.1 mode [4]		Yes	Yes	Yes	Yes	Yes
Downstream user ATM rate		576 kbit/s	1152 kbit/s	2272 kbit/s	Up to 8128 kbit/s[2]	Up to 8128 kbit/s[2]
Upstream user ATM rate		Adaptive[2] between 64 kbit/s and 288 kbit/s	288 kbit/s	288 kbit/s	Adaptive[2] between 64 kbit/s and 448 kbit/s	Adaptive[2] between 64 kbit/s and 832 kbit/s
Fast mode (single latency)		Yes	Yes	Yes	NOTE 1/2	NOTE 1/2

NOTE 1. Interleaving may be enabled as part of the Dynamic Line Management process. See clauses 4.4.2.5 and 4.4.2.6 for more details.

NOTE 2. Note that BT IPstream Connect Max/Max Premium products may under certain circumstances (as outlined in the BT IPstream Connect Max Customer Handbook) be placed onto capped rate profiles to assist in stabilising the line or to ensure line rate is not less than the original line rate when re-grading over from one of the BT IPstream Connect Home & Office products. The capped rate profiles (500, 1000 & 2000) are equivalent to the BT IPstream Connect Home /Office products as per Table 3.

Table 3. End User CPE Parameters

4.4.2.3 ATM Layer Aspects

BT IPstream Connect provides a single ATM virtual channel connection between the end user and BT Core Network. The ATM layer VP at all End User interfaces will be presented with a VPI=0. Within the VP, the BT IPstream Connect Home, BT IPstream Connect Office, BT IPstream Connect Max or IPstream Connect Max

Premium service will present the data channel on VCI=38. Loopback diagnostic traffic VPI/VCI values are defined in SIN346[2].

4.4.2.4 Traffic Shaping

In order to ensure correct operation of the service, upstream ATM traffic (towards the BT network) should be shaped by the customer premises equipment such that it does not peak above the upstream speed to which the modem has adapted. (This will be in the range 64 - 288 kbit/s for BT IPstream Connect Home/Office (or BT IPstream Connect Max/Max Premium if placed on a capped rate profile), 64 - 448 kbit/s for BT IPstream Connect Max and 64 - 832 kbit/s for BT IPstream Connect Max Premium including cell headers and loopback traffic).

4.4.2.5 Dynamic Line Management (DLM)

Dynamic Line Management (DLM) operates on the BT IPstream Connect Max & Max Premium products only. However if a BT IPstream Connect Max or Max Premium product is placed on a capped rate profile (as outlined in the BT IPstream Connect Max Customer Handbook) it will be excluded from DLM.

DLM effectively enables the 'tuning' of a line's performance to ultimately provide an improvement in the level of service delivered to the end user. Historical performance data will be gathered periodically from lines and this will be used to identify those which are performing badly. These lines will then be re-configured automatically (if possible) to give an improvement in their overall ADSL performance and stability. This re-configuration will result in a short break (typically 20 seconds) in end user service.

It is possible that re-configuration of a line could occur daily until a stable configuration is found although it is expected that the majority of poorly performing lines will only require 1-2 re-configurations before reaching a stable point.

The DLM process may result in a decrease in ADSL line rate, but this will only occur where a line is identified as performing badly at a higher rate. DLM will also use interleaving (see sec. 4.4.2.6 below) to fix problem lines (unless the Service Provider has opted out of Interleaving for these lines), and this will result in an increase in the delay over the connection, which may affect some delay sensitive services (e.g. gaming, Video, VoIP).

Notification to the Service provider (via Broadband Customer Reports) will be provided whenever a change is made as part of the DLM process. The DLM process may also be applied manually as part of the standard repair process following an end user fault report.

4.4.2.6 Interleaving

Interleaving is applicable to BT IPstream Connect Max & Max Premium Products only. However if a BT IPstream Connect Max or Max Premium product is placed on a capped rate profile (as outlined in the BT IPstream Connect Customer Max Handbook) it will be excluded from having interleaving applied and will be set to Fast mode.

Interleaving is a standard feature of BTs DSLAMs, and part of the ADSL standard (ITU REC. G.992.1[16]) which can be enabled on any individual line to improve its overall (error) performance and stability. Interleaving effectively introduces powerful error correction algorithms, which in some cases can make the difference between a line working well or not at all. In addition, interleaving may provide a significant improvement in the quality of service experienced by the end user particularly for error sensitive services like video.

Interleaving may be applied to individual lines automatically by the DLM function and may be used where a line is identified as performing badly. BT’s interleaving implementation can increase the delay over the Broadband connection (between 20ms & 40ms), which can affect some delay sensitive services like gaming. In general, interleaving will have no effect on line rate so the end user will not see any reduction in line rate as a result of it being enabled[3].

Note : The typical round trip delay as a result of enabling interleaving is around 20ms, although delays of up to 40ms may be seen on some lines depending on the serving DSLAM

4.4.2.7 Interleaving “Opt Out”

Interleaving “Opt Out” is applicable to BT IPstream Connect Max & Max Premium Only. However if a BT IPstream Connect Max or Max Premium product is placed on a capped rate profile (as outlined in the BT IPstream Connect Max Customer Handbook) it will be excluded from having interleaving applied and therefore the customer preference will not be applied while on the capped rate profile and the service will be provided as Fast mode.

It is possible to opt-out of allowing BT to apply interleaving automatically as part of the DLM process or on an individual line basis at or after the time of order. BT may however temporarily apply interleaving during the repair process to see if it could improve service.

If a line has not been “opted out” and BT has applied interleaving, a Modify Order facility via the BT ordering systems will allow a service provider to “opt out” the line at any time. This will have the effect of removing the interleaving on that line and prevents BT permanently applying interleaving in the future).

Service Providers should consider carefully before selecting this ‘opt-out’ option, since interleaving offers the potential of significant improvements to end user service. Without using interleaving to stabilise a line, other methods may be used, which could lead to a reduction of the achievable line rate.

At the End User premises, the BT IPstream Connect NTE is presented as a “wires-only” interface G.992.1[4] (“G.DMT”) and is described in SIN 346[2].

4.4.2.8 End User Extension

An extension may be required to provide connection between the Master Telephone Socket and the End User CPE, if the ADSL Linebox adapter option is introduced, although such an extension will be outside of the BT IPstream Connect service domain. Where the Customer or End User wishes to provide the extension, this can be implemented using readily available standard computer cabling products. An RJ-45 plug, an RJ-45 socket and an appropriate length of Category 5 UTP cable will be required.

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[3] Applying interleaving does reduce the maximum line rate achievable from 8128 kbit/s to 7616 kbit/s. This will only affect lines capable of rate adapting above 7616 kbit/s and have interleaving applied.

The RJ45 plug and socket should be connected together using category 5 cable as follows:

Pin 1	White / orange
Pin 2	Orange / white
Pin 3	White / green
Pin 4	Blue / white
Pin 5	White / blue
Pin 6	Green / white
Pin 7	White / brown
Pin 8	Brown / white

Note that pins are numbered from the left looking into the socket with the contacts uppermost.

It should be noted that incorrectly or poorly installed internal wiring may significantly reduce the line speed achievable, especially for the higher bandwidth products (i.e. BT IPstream Connect Max & BT IPstream Connect Max Premium). It may also reduce the stability of a line, and thus increase fault rates on that line.

4.4.2.9 PPP layer Aspects

BT IPstream Connect presents a Protocol and encapsulation auto-sensing PPP layer over the ATM.

The following combinations of protocol and encapsulations are supported:-

PPPoA VC-mux,

PPPoA LLC/SNAP

PPPoE LLC/SNAP - single session per VC (ADSL line) only.

The BT IPstream Connect BRAS will automatically configure itself to the protocol presented by the End User's CPE.

Some CPE is itself auto-sensing – in order to ensure that the BRAS and CPE do not constantly chase each other, changing protocols and encapsulations, the BRAS implements a minimum time period before which it will change encapsulation. Following an encapsulation change the BRAS always starts by requesting the creation of a PPPoA session.

The following RFC describe the Protocols and encapsulations used:

RFC 1483[12] – Multi-Protocol encapsulation
RFC 1661[6] – PPP
RFC 2364[5] – PPP over AAL5 (ATM)
RFC 2516[13] – PPP over Ethernet

It should be noted that the use of LLC/SNAP and PPPoE incur a higher protocol overhead and therefore will provide a lower throughput than the use of PPPoA/VC-mux.

4.4.2.10 PPPoE Aspects

If the BT IPstream Connect Customer intends their End User's to use PPPoE, they must ensure that the End Users are provided with a PPPoE client compliant to RFC2516[13] and RFC1661[6].

Note. It is BT's experience that most of the popular PPPoE clients are not compliant to this standard.

PPPoE offered as part of the BT IPstream Connect service is PPPoE over ATM; i.e. an ATM PVC between the End User and BRAS, so there is no shared broadcast domain with other End Users on the BT IPstream Connect Platform. With PPPoE the Maximum Transmission Unit (MTU) is 1492 bytes (i.e. the 1500 byte maximum data size of Ethernet less the PPP header overhead).

Customers allowing the use of PPPoE should be aware there is potential for some PPPoE traffic to be discarded (so called “black-holing” - see RFC2923[14] Section 2.1 for further information). In brief: there are servers on the Internet that send out 1500 byte UDP packets with the “don’t fragment” bit set. MTU discovery does not work well across the Internet as these servers are often behind firewalls that block ICMP and therefore prevent the MTU discovery process from working. In this case, packets larger than 1492 bytes will not meet the PPPoE MTU requirements and so will be discarded. This is not an issue for UDP packets of 1492 bytes or below. This may not be an issue for TCP as the MSS negotiation should ensure packets are small enough.

4.4.3 IP Addressing

PPP is used to obtain IP addresses from the Customers address pool on a per-session basis, as described in SIN 482.

5. Terminal Equipment

It should be noted that BT provides a CPE test laboratory to enable suppliers and Customers to satisfy themselves that their CPE and services will interoperate correctly with BT's G.DMT ADSL services.

5.1 USB modem configuration

For the higher bandwidth products (BT IPstream Connect Max & BT IPstream Connect Max Premium) particular attention should be paid to the configuration of modems connected via the Universal Serial Bus (USB) as these may cause limitations or issues on the service.

USB devices can have two different transfer modes, bulk mode, and isochronous mode. Bulk mode uses the available USB bandwidth, and isochronous mode reserves the bandwidth it requires. This means that modems operating in bulk mode can suffer from rate limiting, as the modem is unable to match the USB rate to the DSL rate. This is due to USB1 only having ~11Mbit/s half-duplex bandwidth for all devices on the channel.

The fix may be to switch the modem from bulk mode into isochronous mode, however not all modems support isochronous mode. Some modems may be upgradeable to resolve the problem; others may have to be replaced if the best throughput is to be achieved.

It may be that by changing these settings on a particular Modem could also result in a reduction of speed, or other problems. Therefore it is highly recommended that service providers contact their modem supplier to ensure that any USB modems that are to be use are configured correctly to give the best possible throughput.

5.2 Router& Modem Drivers/Firmware

It is important that SPs check that they have the latest drivers for their CPE to ensure it works at the optimum level. It has been found that this is a major factor in incorrectly reported faults. It is the Service Providers responsibility to ensure the correct firmware and/or driver are supplied to the end user before faults are reported to BT. Therefore it is highly recommended that service providers contact their CPE supplier to ensure that any CPE that they are using the correct drivers and or firmware to give the best possible throughput and to support the BT IPstream Connect service.

6. References

Suppliers Information Notes:

[1]	SIN 302	BT's Internet Protocol (IP) Transport Services	Latest Issue
[2]	SIN 346	BT ADSL Interface Specification	Latest Issue

BT Suppliers' Information Notes may be obtained from our www site at: https://www.bt.com/about/sinet

BT Customer Handbooks

[3]	BT IPstream Connect Max Customer Handbook	Latest Issue

BT IPstream Connect Max Customer Handbook

ITU-T Documents

[4]	G.992.1	Asymmetrical digital subscriber line (ADSL) transceivers

Internet Engineering Task Force Request for Comments:

[5]	RFC 2364	PPP Over AAL5
[6]	RFC 1661	The Point-to-Point Protocol (PPP)
[7]	RFC 1334	PPP Authentication Protocols
[8]	RFC 1994	PPP Challenge Handshake Authentication Protocol (CHAP)
[9]	RFC 1332	The PPP Internet Protocol Control Protocol (IPCP)
[10]	RFC1877	PPP Internet Protocol Control Protocol Extensions for Name Server Addresses
[11]	RFC 1631	The IP Network Address Translator (NAT)
[12]	RFC 1483	Multiprotocol Encapsulation over ATM Adaptation Layer 5
[13]	RFC 2516	A Method for Transmitting PPP Over Ethernet (PPPoE)
[14]	RFC 2923	TCP Problems with Path MTU Discovery

7. Abbreviations

Acronym	Expansions
AAL5	ATM Adaptation Layer 5
ABC	Alarms By Carrier [BT]
ADSL	Asymmetric Digital Subscriber Line
ATM	Asynchronous Transfer Mode
BAS	Broadband Access Server
BRAS	Broadband Remote Access Server
BT	British Telecommunications plc
CHAP	Challenge Handshake Authentication Protocol [IETF]
CPE	Customers' Premises Equipment

Acronym	**Expansions**
DLM	Dynamic Line Management [BT system]
G.DMT	G-series Discrete Multi-Tone [ITU-T]
HG	Home Gateway
IP	Internet Protocol [IETF]
IPCP	Internet Protocol Control Protocol [IETF]
IPstream	BT IPstream Connect
ISDN	Integrated Services Digital Network
ITU	International Telecommunications Union
ITU-T	International Telecommunication Union - Telecommunications Standardization Sector
LLC	Logical Link Control
LNS	L2TP Network Server
LTS	L2TP Tunnel Switch
MSS	Maximum Segment Size
MTU	Maximum Transmission Unit
NTE	Network Termination Equipment
NTE5	Network Terminating Equipment No. 5
PAP	Password Authentication Protocol [IETF]
PBX	Private Branch Exchange
PC	Personal Computer
PPP	Point-to-Point Protocol [IETF]
PPPoA	Point-to-Point Protocol over Asynchronous Transfer Mode
PPPoE	Point-to-Point Protocol over Ethernet
PSTN	Public Switched Telephone Network
PVC	Permanent Virtual Connection
RADIUS	Remote Authentication Dial In User Service [IETF]
RFC	Request for Comment [IETF]
RJ45	Registered Jack 45
SIN	Suppliers' Information Note [BT]
SNAP	Sub Network Access Protocol
SoHo	Small office Home office
SP	Service Provider (Providers of Electronic Communications Services)
STIN	Suppliers' Trial Information Note
TCP	Transmission Control Protocol [IETF]
UTP	Unscreened Twisted Pair
VC	Virtual Connection [ATM]
VCI	Virtual Connection Identifier [ATM]
VP	Virtual Path
VPI	Virtual Path Identifier [ATM]

8. History

Issue	Date	Details of change
SIN 485 Issue 1.0	19 June 2008	First Issue
Issue 1.1	March 2011	Reference to IPstream Home 250 product removed (product withdrawn)
Issue 1.2	April 2013	Note added to introduction advising of retirement of the IPstream Connect EU service within the WBC footprint
Issue 1.3	October 2015	IPstream Retirement information updated and removal of reference to obsolete Home 250 product SINet site references changed from http://www.sinet.bt.com to http://www.btplc.com/sinet/
Issue 1.4	September 2020	Change SINet site references from http://www.btplc.com/sinet/ to https://www.bt.com/about/sinet

< END >

ANNEX A - DIFFERENCES COMPARED TO PREVIOUS ISSUE OF SIN 485

Table A.1 provides a *brief* description of the *major* changes between this issue of Suppliers' Information Note 485 and the previous issue. Please refer to the main body of the document for full descriptions of each topic.

DESCRIPTION	REF. SECTION
Removal of references to IPstream Home 250 Product	3, 4.1, 4.3, 4.4.2
Note added to introduction advising of retirement of the IPstream EU service within the WBC footprint by Spring 2014.	1
Note updated in introduction advising of retirement of the IPstream EU service within the WBC footprint.	1
IPstream Retirement information updated and removal of reference to obsolete Home 250 product	1, 4

Table A.1 List of major changes from previous issue of SIN 485